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Belief in God, belief in science: Exploring the psychological correlates of
scientific fundamentalism as implicit religion

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Abstract

Bailey's notion of implicit religion suggests that in contemporary societies the functions served by formal or explicit religions may be assumed by other systems of beliefs. The present paper tests this thesis in respect of the effect of an exaggerated, uncritical, and unqualified belief in the inerrancy of science, which we label 'scientific fundamentalism', among a sample of 11,809 13- to 15-year-old students drawn from the four nations of the UK. Previously established research has shown that, after controlling for personal and psychological factors, explicit religion has a positive effect on both self-esteem and empathy. These established findings have been confirmed in the present study employing the Astley-Francis Scale of Attitude toward Theistic Faith as a measure of explicit religion. Moreover, the new data also demonstrate that scientific fundamentalism conceptualised as implicit religion has a positive effect on both self-esteem and empathy, although this effect is somewhat smaller. These new data provide some support for Bailey's conceptualisation of implicit religion, by indicating that scientific fundamentalism is functioning in relation to self-esteem and empathy in the same way as explicit religion.

Keywords: implicit religion, belief in science, psychology of religion, scientific fundamentalism, self-esteem, empathy

Introduction

Introducing implicit religion

Two recent special issues of journals have drawn attention to the interest growing within the psychology of religion in the notion of implicit religion proposed by Bailey (1997, 1998): a special issue of *Implicit Religion* edited by Schnell, Francis, and Lewis (2011), and a special issue of *Mental Health, Religion and Culture* edited by Lewis (2013). Bailey's conceptualisation of implicit religion provides a heuristic tool for interrogating the presence of phenomena within secular societies that behave in ways analogous to religion. For Bailey implicit religion may be characterised by (but is not limited to) three key qualities:

Implicit religion displays *commitment*; it is something to which individuals feel committed. Implicit religion provides *integrating foci*; it is something that draws together the identity of an individual (or a group) and in doing so furnishes meaning and generates purpose. Implicit religion displays *intensive concerns with extensive effects*; it is something that helps to shape a worldview and carries implications for the way in which life is lived. (Francis, Flere, Klanjšek, Williams, & Robbins, 2013, p. 953)

Bailey's account of implicit religion, then, is an intentionally broad and multi-faceted construct which takes seriously the persistence of religious, spiritual and secular worldviews within contemporary British societies, in ways both continuous with and discontinuous from the conventional practice of Christianity (Bailey, 1997, 1998, 2002). Empirical research concerned with the study of implicit religion has operationalised this concept in three main ways. The implicit religion of contemporary belief systems and spiritual practices has been operationalised as belief in luck (Francis, Robbins, & Williams, 2006; Francis, Williams, & Robbins, 2006, 2008), belief in the paranormal (Williams, Francis, & Robbins, 2011), commitment to spirituality (Hughes, 2013), commitment to New Age beliefs (Kemp, 2001;

Francis, Flere, Klanjšek, Williams, & Robbins, 2013), and personal belief in supernatural forces (Schuurmans-Stekhoven, 2014). The implicit religion of secular activities has been operationalised as the interior life of a British public house (Bailey, 1997), the practice of football (French, 2002), the spirituality of the practice of belly dancing (Kraus, 2009), the personality cult of Prince (Till, 2010), American commercial sales organisations (Palmisano & Pannofino, 2013), celebrity worship (Aruguete, Griffith, Edman, Green, & McCutcheon, 2014), and straight edge Punk (Stewart, 2017). The implicit religion of more conventional religious practices has been operationalised as the implicit religion of contemporary pilgrimage and ritual (Schnell & Pali, 2013), and the implicit religion of prayer requests (ap Sion & Edwards, 2013; ap Sion & Nash, 2013). Working within this broad theoretical framework of implicit religion, the present study is concerned to explore the extent to which an exaggerated, uncritical and unqualified belief in science may function as an implicit religion within the lives of believers.

Belief in science

A series of studies initiated by Fulljames and colleagues has taken a special interest in defining and assessing belief in science within empirical investigations of the perceived conflict between science and religion among adolescents (see Fulljames & Francis, 1988; Francis, Gibson, & Fulljames, 1990; Fulljames, Gibson, & Francis, 1991; Francis & Greer, 2001; Astley & Francis, 2010; Francis, Astley, & McKenna, 2018). Fulljames was particularly interested in the view that scientific theories can attain to absolute truth. This view of the nature of science, he argues, ‘may become associated with the claim that science alone is of value in explaining phenomena and in solving problems’ (Francis, Gibson, & Fulljames, 1990, p. 5). These ways of looking at science have much more in common with the position that has become known as *scientism* than with the view of science more

generally espoused by professional scientists (see, e.g., Coyne, 2009, p. 16; Kampourakis, 2014, p. 56).

Scientism has been defined and characterised in a variety of ways (Midgley, 1985, p. 28; Peacocke, 1993, p. 8; Sorell, 1994, pp. 1-3, 176-177; Noordhof, 1995, p. 814; Dupré, 2001, p. 1; Alexander, 2001, pp. 273, 285; Peterson, 2003; Stenmark, 2003; Maxwell, 2003; Draper, 2005, p. 280; Schloss, 2006, p. 190; Haught, 2006, pp. 4-5, 45; Peters, 2006, p. 376; Kidd, 2014). Essentially, scientism represents an exaggerated, uncritical, and unqualified (and therefore distorted) appreciation of and trust in science. It reflects a belief in science's cognitive supremacy and its universal, unlimited applicability; and asserts or implies that absolute truth may be obtained by science and that science is the only source of real (or of valuable) knowledge.

Critics of scientism regard it as no part of science, but understand it instead as a philosophical, metaphysical, or ideological position (Nagel, 1986, p. 9; Feyerabend, 1987, p. 36; Padgett, 2003, p. 71; Sorell, 1994, chs 1, 2 and 6; Stenmark, 2003; Peters, 2006, p. 377; Hutchinson, 2011, pp. 1-2, 105-106; Burnett). They contend that science is not the only 'sure path to truth' (cf. Ward, 2008, ch. 7), and that scientism contrasts markedly with the fallibilism and revisability that most philosophers of science regard as being at the heart of the scientific method (cf. Giere, 2006, pp. 15-16). As a perspective on and commitment to science, scientism may be regarded as a 'belief *in*' science that shares many of the affective and behavioural aspects of trust, allegiance, and positive evaluation displayed in the religious believers' faith in or belief in God (cf. Astley, 2018, p. 17). Scientism extends so far as to embrace the virtue of hope, in the form of 'resilient sanguinity' (Haught, 2006, p. 194; cf. Gray, 2004, p. 45); the emotions of consolation, awe, and ecstasy (Dawkins); and the benefits of salvation (Gray, 2004, pp. 30, 66).

It is not surprising, then, that scientism has been viewed (despite the protests of its advocates) as ‘essentially a religious position’ (Hutchinson, 2011, p. 3), as analogous to a religion, or as functioning as a replacement for it. It is frequently accused of showing ‘veneration’, ‘excessive passion’, or an exaggerated respect for science that may even be said to border on worship (Midgley, 1985, p. 28; Sorrell, 1991, p. 177; Kidd, 2014). Like religion, scientism offers ‘a comprehensive principle of belief, which cannot be proved ... but which serves to organize our understanding and guide our actions’; it is ‘an all-encompassing world-view that serves ... the purpose of religion’ (Hutchinson, 2011, pp. 3, 126-127; cf. Lessl, 1996). It is sometimes characterised as a form of faith (‘in the superiority of natural scientific rationality’: van Huyssteen, 1998, p. 46; and/or ‘that science has no boundaries’ (Philosophy Basics). The label of ‘fundamentalism’ has been applied pejoratively to scientism, because of its endorsement of ‘the fundamentalist belief that science can do no wrong and will ultimately answer any question worth answering while in the process saving humankind as a bonus’ (Pigliucci, 2002, p. 114). ‘Scientism’s single-minded adherence to only the empirical, or testable, makes it a strictly scientific worldview, in much the same way that a Protestant fundamentalism that rejects science can be seen as a strictly religious worldview’ (Public Broadcasting Service). Others have inveighed against ‘the myth of science’, employing a term that, in religious debate, carries the connotation not so much of a (literal) untruth as of a story-metaphor that guides all one’s experience and understanding (O’Hear, 1989, pp. 204, 206; Maitland, 1994, p. 15; Peters, 2006, p. 376).

For these and other reasons, if and when science is interpreted from such a scientific perspective, ‘it is ridiculous to see it as the polar opposite of religion’ (Eagleton, 2009, p. 133). In this paper, as in Francis, Astley, and McKenna (2018), we refer to the exaggerated, uncritical, and unqualified belief in the inerrancy of science as ‘scientific fundamentalism’, drawing a parallel with the ‘central tenet’ of Christian religious fundamentalism that the

Bible is inerrant, incapable of being wrong (Collins, 1983; cf. Barr, 1981, pp. 1, 36-37, 40, 51-55, 97-98; 1984, ch. 13).

Measuring belief in science

Fulljames' scale measuring an exaggerated belief in science, as reported by Fulljames, Gibson, and Francis (1991) and by Francis and Greer (2001), comprised the following five items:

- Science will eventually give us complete control over the world.
- Theories in science can be proved to be definitely true.
- The laws of science will never be changed.
- Theories in science are never proved with absolute certainty (reverse coded).
- Nothing should be believed unless it can be proved scientifically.

The internal consistency reliability of this instrument was, however, quite poor. Among a sample of 729 16- to 18-year-old students in Scotland, Fulljames, Gibson, and Francis (1991) reported an alpha coefficient of .56. Among a sample of 1,584 14- to 16-year-old students in Northern Ireland, Francis and Greer (2001) reported an alpha coefficient of .54.

In order to improve on Fulljames' measure, Astley and Francis (2010) proposed a seven-item scale, adding the following two items to Fulljames' original five items:

- Science can give us absolute truths.
- Science alone can provide truths about nature.

Among a sample of 187 female sixth-form students, Astley and Francis (2010) reported an alpha coefficient of .77. Subsequently, in order to provide a shorter reliable measure, Francis, Astley, and McKenna (2018) proposed a three-item scale (which they renamed as a measure of scientific fundamentalism), comprising the following items from the seven-item scale:

- Theories in science can be proved to be definitely true.
- The laws of science will never be changed.

- Science can give us absolute truths.

Among a sample of nearly 11,809 13- to 15-year-old students, Francis, Astley, and McKenna (2018) reported an alpha coefficient of .69.

In an independent strand of research, Farias, Newheiser, Kahane, and de Toledo (2013) proposed a ten-item scale of belief in science that comprised the following items:

- Science provides us with a better understand of the universe than does religion.
- ‘In a demon-haunted world, science is a candle in the dark.’ (Carl Sagan)
- We can only rationally believe in what is scientifically provable.
- Science tells us everything there is to know about what reality consists of.
- All the tasks human beings face are soluble by science.
- The scientific method is the only reliable path to knowledge.
- The only real kind of knowledge we can have is scientific knowledge.
- Science is the most valuable part of human culture.
- Science is the most efficient means of attaining truth.
- Scientists and science should be given more respect in modern society.

Among a sample of 144 rowers, Farias, Newheiser, Kahane, and de Toledo (2013) reported an alpha coefficient of .86. In a subsequent study among 373 Iranian students, Aghababaei (2016) reported an alpha coefficient of .87 for the Persian translation of the instrument.

In another strand of research, Rosenkranz and Charlton (2013) proposed a five-item scale of ‘science acceptance’ alongside a 15-item scale of ‘religious orientation’. Together these two scales comprised their Existential Orientation Scale. The science acceptance scale comprised the following items:

- I trust in science and human rationality.
- I make important decisions in my life based on rational analysis.
- The nature of existence can be explained through scientific principles.

- My life is guided purely by science and logic.
- It is up to humankind to forge its own destiny.

Among a sample of 227 participants attracted by general online research recruitment websites for psychological studies, Rosenkranz and Charlton (2013) reported an alpha coefficient of .82.

A small number of empirical studies have begun to explore the extent to which belief in science may share the same characteristics as, or similar correlations with, belief in God or religion. For example, scientific ideas can be a source of meaning (Preston, 2012), generate feelings such as awe (Rogers, 2004; Sagan & Druyan, 2006), relate to stress and existential anxiety (Farias, Newheiser, Kahane, & de Toledo, 2013), and correlate positively with happiness and hope (Aghababaei, 2016).

Psychology of implicit religion

One way in which the psychology of religion has tested the notion of implicit religion has been to explore the extent to which constructs that purport to access aspects of implicit religion serve the same psychological functions in people's lives as constructs that access aspects of explicit religion. This approach has been applied especially within the strand of implicit religion concerned with the persistence of Christian believing within the UK, in spite of well-documented decline in church attendance. For example, within this strand of implicit religion, Walker, Francis, and Robbins (2010) and Walker (2013) proposed the belief that 'You don't have to go to church to be a Christian' as one possible valid indicator of implicit religion within British society.

Taking the indicator of implicit religion proposed by Walker, Francis, and Robbins (2010) and Walker (2013), Francis (2013a, 2013b) set out to test the extent to which this form of implicit religion served the same psychological functions in people's lives as explicit religion. In the first of these two studies, Francis (2013a) tested the hypothesis in relation to

sense of purpose in life, since explicit religiosity has been routinely associated with an enhanced sense of purpose in life (see Francis & Robbins, 2009). In the second study, Francis (2013) tested the hypothesis in relation to suicidal ideation, since explicit religiosity has been routinely associated with lower levels of suicidal ideation (see Robbins & Francis, 2009).

The findings from the two studies reported by Francis (2013a) and Francis (2013b) were not identical. In the study of purpose in life both explicit religiosity and implicit religiosity predicted a significantly higher level of purpose in life; in the second study explicit religiosity predicted a significantly lower level of suicidal ideation, but implicit religiosity was not significantly related to suicidal ideation. The incompatibility of the findings from the two studies suggest that there are some ways in which the form of implicit religion captured by the sentiment that you do not have to go to church to be a Christian serves the same function as explicit religion captured by church attendance, but that there are other ways in which this is not the case. Drawing on the evidence from the two studies so far available to examine the issue, it is reasonable to propose that implicit religion may work in the lives of individuals in the same way as explicit religion to generate positive psychological outcomes like positive affect and the sense of meaning and purpose, but that implicit religion may not work in the lives of individuals in the same way as explicit religion to offer protection from negative psychological outcomes like negative affect and the sense of despair and meaninglessness.

Building on the two studies reported by Francis (2013a) and Francis (2013b), Penny and Francis (2015) tried to access and operationalise Bailey's notion of implicit religion by a different measure, this time focusing on attachment to traditional Christian rites of passage in terms of baptism, marriage, and death. They selected as their dependent variable a nine-item scale of attitude toward substances, since empirical studies exploring the relationship between explicit religiosity and substance use tend to demonstrate that higher levels of church

attendance are associated with lower levels of alcohol consumption, drunkenness, and alcohol-related problems among young people and adults (see Fawcett, Francis, Linkletter, & Robbins, 2012). Data from this study support the hypothesis that (within the operationalisations employed) implicit religion and explicit religion serve similar functions, where both religious variables make a significant contribution to the development of proscriptive attitudes toward substances among young people.

In a further study, Francis and Penny (2016) employed the same measure of implicit religion as that employed by Penny and Francis (2015), but among a different population and with different dependent measures. On this occasion, the sample was defined as participants within the Teenage Religions and Values Survey who checked the religious affiliation category 'none' and the religious attendance category 'never'. Here were young people who were living and growing up outside the sphere of explicit religion. On this occasion the dependent variables were two measures concerned with psychological wellbeing: a scale of positive affect building on the work reported by Francis (2013a) concerning purpose in life, and a scale of negative affect building on the work reported by Francis (2013b) concerning suicidal ideation. These data demonstrated that young people who have no religious affiliation and who never attend worship services but who remained attached to traditional Christian rites of passage (conceived as an indicator of implicit religion) displayed higher levels of psychological wellbeing, in a way consistent with the effects of explicit religion. Moreover implicit religion exercised a stronger influence on strengthening positive affect than on reducing negative affect.

Psychological correlates of religiosity

The foregoing studies reported by Francis and colleagues have employed a range of established dependent variables identified within the broad literature of the empirical psychology of religion as being correlated with individual differences in explicit religion,

including purpose in life (Francis, 2013a), suicidal ideation (Francis, 2013b), attitude toward substances (Penny & Francis, 2015), and positive and negative psychological wellbeing (Francis & Penny, 2016). The present study expands the range of dependent variables employed within this research tradition by exploring self-esteem as assessed by the Rosenberg Self-esteem Scale (Rosenberg, 1965) and empathy as assessed by the family of measures derived from Mehrabian and Epstein (1972).

The psychometric assessment of the connection between religiosity and self-esteem has been explored by a number of studies, including Nelson (1990), Ryan, Rigby, and King (1993), Jones and Francis (1996), Blaine, Trivedi, and Eshleman (1998), Schludermann, Schludermann, and Huynh (2000), Francis and Kaldor (2002), Krause (2004, 2009, 2012), Whittington and Scher (2010), Mochon, Norton, and Arierly (2011), Blazek and Besta (2012), Penny and Francis (2014), Mousavimoghadam, Nourmohammadil, Ranjbarian, and Rashidahal (2014), Davis and Kiang (2016), and Smith and Crosby (2017). Taken together these studies demonstrate that the relationship between religiosity and self-esteem may vary according to the conceptualisation and operationalisation of religiosity employed and according to the conceptualisation and operationalisation of self-concept employed. However, there is also consistent evidence of a positive association between the measure of self-esteem developed by Rosenberg (1965) and intrinsic religiosity, and positive religious affect.

For example, Nelson (1990) administered the Rosenberg Self-esteem Scale to 68 elderly persons, together with a question about church attendance and the Age Universal Religious Orientation Scale (Gorsuch & Venable, 1983). He found that self-esteem was uncorrelated with church attendance, and uncorrelated with extrinsic religiosity, but significantly positively correlated with intrinsic religiosity. Schludermann, Schludermann, and Huynh (2000) administered the short form of the Francis Scale of Attitude toward

Christianity (Francis, Lewis, Philipchalk, Lester, & Brown, 1995) alongside the Rosenberg Self-esteem Scale to a sample of 741 high school students (grades 9 to 12) in Catholic schools in Winnipeg, Canada. They reported a positive correlation between the two variables. Francis and Kaldor (2002) administered a measure of belief in God (a single item assessed on a four-point scale) alongside the Rosenberg Self-esteem Scale to 1,010 adults who participated in an Australian population survey. They reported a positive correlation between the two variables. Penny and Francis (2014) administered the Astley-Francis Scale of Attitude toward Theistic Faith (Astley, Francis, & Robbins, 2012) alongside the Rosenberg Self-esteem Scale to 10,793 13- to 15-year-old students. They, too, reported a positive association between the two variables after controlling for sex, age, and personality.

The psychometric assessment of the connection between religiosity and empathy has been explored by a number of studies, including Watson, Hood, Morris, and Hall (1984), Watson, Hood, and Morris (1985), Francis and Pearson (1987), Duriez (2004a, 2004b), Furrow, King, and White (2004), Khan, Watson, and Habib (2005), Paek (2006), Francis (2007), Markstrom, Huey, Stilos, and Kraus (2010), Francis, Croft, and Pyke (2012), Hardy, Walker, Rackham, and Olsen (2012), Glaz (2015), and Rashidi, Mousavi, and Esmaeili (2016). Taken together these studies demonstrate that the relationship between religiosity and empathy may vary according to the conceptualisation and operationalisation of religiosity employed and according to the conceptualisation and operationalisation of empathy employed. However, there is also consistent evidence of a positive association between measures of empathy derived from Mehrabian and Epstein (1972) and intrinsic religiosity, positive religious affect, and loving God images.

For example, Watson, Hood, Morris, and Hall (1984) administered the scales of intrinsic and extrinsic religiosity developed by Allport and Ross (1967) together with the Questionnaire Measure of Emotional Empathy developed by Mehrabian and Epstein (1972)

to a sample of 180 undergraduate students. They found a positive correlation between empathy and intrinsic religiosity, but a negative correlation between empathy and extrinsic religiosity. Francis and Pearson (1987) administered the empathy scale derived from Mehrabian and Epstein (1972) included within the Junior Eysenck Impulsiveness Inventory (Eysenck, Easting, & Pearson, 1984) together with the Francis Sale of Attitude toward Christianity (Francis, Lewis, Philipchalk, Brown, & Lester, 1995) to a sample of 569 11- to 17-year-old students. They found a positive correlation between empathy and religiosity, after controlling for sex and age. Francis (2007) administered the empathy scale from the Junior Eysenck Impulsiveness Inventory (Eysenck, Easting, & Pearson, 1984) together with the semantic differential God Images Scale developed by Francis, Robbins, and Gibson (2006) to a sample of 1,826 secondary school students in England. After controlling for sex, age, and personality, they found a significant link between higher levels of empathy and positive God images and a significant link between lower levels of empathy and negative God image. Francis, Croft, and Pyke (2012) administered the empathy scale from the Junior Eysenck Impulsiveness Inventory (Eysenck, Easting, & Pearson, 1984) together with the New Index of God Images developed for that study to a sample of 5,993 13- to 15-year-old students. After controlling for sex, age, and personality, they found the image of God as a God of mercy is associated with higher empathy scores, while the image of God as a God of justice is associated with lower empathy scores.

Control variables

Empirical studies exploring the connections between religion, self-esteem, and empathy need to take two main control variables into account. The first main control variable is sex. In his pioneering review of empirical studies within the psychology of religion, Argyle (1958) concluded that the most secure finding was that women were more religious than men. More recent reviews have confirmed that, within Christian and post-Christian cultures, this

finding has remained secure in relation to a number of indices of religious practice, religious beliefs, and religious attitudes (Francis, 1997; Francis & Penny, 2014). Women also record higher scores of empathy on measures derived from Mehrabian and Epstein (1972), as evidenced by Francis and Pearson (1987), Gudjonsson, Einarsson, Bragason, and Sigurdsson (2006), and Francis, Croft, and Pyke (2012). On the other hand, women record lower scores on the measure of self-esteem proposed by Rosenberg (1965), as evidenced by Furnham and Cheng (2000), Miyamoto *et al* (2001), and Penny and Francis (2014).

The second main control variable is personality. A model of personality that has proved to be particularly fertile within the empirical psychology of religion is the three dimensional model proposed by Hans Eysenck and his associates and operationalised in a series of self-completion instruments for application both among adults, including the Eysenck Personality Questionnaire (Eysenck & Eysenck, 1975) and the Eysenck Personality Questionnaire Revised (Eysenck, Eysenck, & Barrett, 1985), and among young people, including the Junior Eysenck Personality Questionnaire (Eysenck & Eysenck, 1975) and the Junior Eysenck Questionnaire Revised (Corulla, 1990). Eysenck's dimensional model of personality proposes that individual differences in personality can be most economically and adequately summarised in terms of three orthogonal higher order factors: extraversion, neuroticism, and psychoticism. Recent studies have demonstrated that higher levels of explicit religiosity are especially associated with lower psychoticism scores (Francis, 1992; Francis & Hermans, 2009; Lewis & Francis, 2014), that higher levels of empathy are especially associated with higher levels of neuroticism scores (Gudjonsson, Einarsson, Bragason, & Sigurdsson, 2006; Francis, Croft, & Pyke, 2012), and that high self-esteem scores are especially associated with stable extraversion (Chan & Joseph, 2000; Cheng & Furnham, 2003; Valero-Aguayo, Ferro-Garcia, Lopez-Bermudez, & Selva-Lopez de Hualde, 2012).

Research question

Against this background, the aim of the present analyses is to draw on the rich data generated by the Young People's Attitudes to Religious Diversity Project conducted across the four nations of the UK (see Francis, Croft, Pyke, & Robbins, 2012) in order to address two primary research questions. The first research question draws on the Astley-Francis Scale of Attitude toward Theistic Faith (Astley, Francis, & Robbins, 2012) as a measure of explicit religion in order to test whether the established research findings linking explicit religion with higher levels of self-esteem and with higher levels of empathy hold true within this sample of 11,809 13- to 15-year-old students, while simultaneously taking into account the effects of personal factors (sex and age) and psychological factors (extraversion, neuroticism, and psychoticism). The second research question draws on a scale of scientific fundamentalism as a measure of implicit religion, in order to test whether belief in science of this kind functions in the same way as explicit religion in relation to higher levels of self-esteem and higher levels of empathy.

Method**Procedure**

As part of a project concerning the social and psychological correlates of religious diversity within the four nations of the UK, classes of 13- to 14-year-old students and classes of 14- to 15-year-old students were invited to complete a detailed questionnaire survey. The participants were guaranteed confidentiality and anonymity, and were given the choice not to participate in the research project.

Instrument

The following indices from the *Religious Diversity and Young People* questionnaire were employed in the present analyses.

Age and sex were assessed by dichotomous items: male (1), and female (2); 13- to 14-years (1), and 14- to 15-years (2).

Personality was assessed by the abbreviated form of the Junior Eysenck Personality Questionnaire Revised (JEPQR-A; Francis, 1996). This instrument proposes three six-item measures of extraversion, neuroticism, and psychoticism. Each item is rated on a dichotomous scale: yes (1), and no (0). An example item from the extraversion scale is: Do you like going out a lot? An example item from the neuroticism scale is: Are your feelings rather easily hurt? An example item from the psychoticism scale is: Would you enjoy practical jokes that could sometimes harm people?

Scientific fundamentalism was assessed by a three-item scale developed from the seven-item measure proposed by Astley and Francis (2010). Each item is rated on a five-point Likert scale: agree strongly (5), agree (4), not certain (3), disagree (2), and disagree strongly (1). An example item is: Science can give us absolute truths.

Theistic faith was assessed by the seven-item Astley-Francis Scale of Attitude toward Theistic Faith proposed by Astley, Francis, and Robbins (2012). Each item is rated on a five-point Likert scale: agree strongly (5), agree (4), not certain (3), disagree (2), and disagree strongly (1). An example item is: I know that God helps me.

Self-esteem was assessed by the ten-item Self-esteem Scale proposed by Rosenberg (1965) and modified for rating on a five-point Likert scale: agree strongly (5), agree (4), not certain (3), disagree (2), and disagree strongly (1). An example item is: I feel that I have a number of good qualities.

Empathy was assessed by the 23-item empathy scale of the Junior Eysenck Impulsiveness Questionnaire (JIVE; Eysenck, Easting, & Pearson, 1984), an instrument derived from the adult measure of emotional empathy proposed by Mehrabian and Epstein

(1972). Each item is assessed as a dichotomous scale: yes (1), and no (0). An example item is: Would you feel sorry for a lonely stranger in a group?

Participants

Completed data were submitted by 11,809 participants: 5,519 male students, 6,216 female students, and 74 students of undisclosed sex; 6,042 students aged 13 to 14 years, 5,720 students aged 14 to 15 years, and 47 students of undisclosed age. In terms of explicit religious practice, 40% of the students never attended worship services, 28% attended less than six times a year, 5% attended at least six times a year, 6% attended at least once a month, and 21% attended nearly every week.

Analysis

The data were analysed by the SPSS statistical package, drawing on the frequency, correlation, reliability, and regression routines. The regression routine employed fixed order blockwise entry so that the three sets of variables (personal, psychological, and religious) were structured incrementally, in such a way that the additional variance accounted for by the religious variables (explicit and implicit) became identified in the final model.

Results and discussion

- insert table 1 about here -

The first step in data analysis explored the scale properties of the seven measures selected for the analyses. These data are presented in table 1. With the exception of the psychoticism scale, the other six measures report satisfactory alpha coefficients (Cronbach, 1951) in excess of the threshold of .65 recommended by DeVellis (2003). The lower internal consistency reliability of the psychoticism scale is consistent with the recognised problems in conceptualising and operationalising this dimension of personality (Francis, Brown, and Philipchalk, 1992). These data demonstrate that the measures function satisfactorily within the present study.

- insert table 2 about here -

The second step in data analysis explored the bivariate correlation coefficients between the two personal factors (sex and age), the three psychological factors (extraversion, neuroticism, and psychoticism), the two religious factors (explicit and implicit), and the two dependent variables (self-esteem and empathy). Six conclusions emerge from these data. First, there is a significant inverse correlation between scientific fundamentalism (the form of implicit religion under consideration here) and attitude toward theistic faith (the form of explicit religion under consideration here). Young people who believe in science *in this way* are less likely to have faith in God, while young people who have faith in God are less likely to believe in science in this way, a finding consistent with previous research (see Farias, Newheiser, Kahane, & de Toledo, 2013; Aghababei, 2016). Second, both scientific fundamentalism and theistic faith are significantly correlated with sex, but in opposite directions. Female students recorded higher scores on the scale of theistic faith, a finding consistent with much previous research (see Francis, 1997; Francis & Penny, 2014). Male students recorded higher scores on the scale of scientific fundamentalism, a finding also consistent with previous research (see Fulljames, Gibson, & Francis, 1991; Rosenkranz & Charlton, 2013).

Third, the personality variables predict individual differences in both scientific fundamentalism and theistic faith. Both scientific fundamentalism and theistic faith are significantly correlated with psychoticism scores. Higher levels of theistic faith are associated with lower psychoticism scores, a finding consistent with much previous research (see Francis, 1992; Francis & Hermans, 2009; Lewis & Francis, 2014). Higher levels of scientific fundamentalism are associated with higher psychoticism scores. The correlations with psychoticism are not independent of sex differences. Females record lower scores on

psychoticism and higher scores on theistic faith, while males record higher scores on psychoticism and higher scores on scientific fundamentalism.

Fourth, self-esteem (as assessed by the Rosenberg instrument) is significantly correlated with both sex and personality. According to this measure, higher scores of self-esteem are associated with being male, with extraversion, with emotional stability (low neuroticism) and with tendermindedness (low psychoticism). These findings are broadly consistent with earlier studies (see Miyamoto *et al*, 2001; Penny & Francis, 2014; Davis & Kiang, 2016).

Fifth, empathy (as assessed by the Mehrabian and Epstein measure) is significantly correlated with both sex and personality. According to this measure, higher scores of empathy are associated with being female, with extraversion, with emotional lability (higher neuroticism), and with tendermindedness (lower psychoticism). These findings are also broadly consistent with earlier studies (see Eysenck & Eysenck, 1980; Eysenck & McGurk, 1980; Eysenck, 1981; Gudjonsson, Einarsson, Bragason, & Sigurdsson, 2006; Francis, Croft, & Pyke, 2012).

Sixth, the bivariate correlations also offer initial insight into the associations between the two dependent variables (empathy and self-esteem) and the two independent variables (theistic faith and scientific fundamentalism). These data suggest that theistic faith is associated with better self-esteem ($r = .15, p < .001$) and with greater empathy ($r = .18, p < .001$). However, scientific fundamentalism is not associated with higher empathy ($r = .01, NS$) and only weakly associated with better self-esteem ($r = .03, p < .001$). These particular findings, however, are vulnerable in light of the complex pattern of intercorrelations among the variables. It is for this reason the study progresses to regression analyses.

- insert tables 3 and 4 about here -

The third step in data analysis employed a sequence of regression models. Table 3 presents data in respect of self-esteem as the dependent variable, and table 4 presents data in respect of empathy as the dependent variable. In both tables the first column re-presents the correlation coefficients from table 2 so that these can be read easily alongside the beta weight presented in the other columns. In both tables model three examines the impact of explicit religion (theistic faith) when the personal factors (sex and age) and the psychological factors (extraversion, neuroticism, and psychoticism) are also in the equation. Model four examines the impact of implicit religion (scientific fundamentalism) when the personal factors and the psychological factors are also in the equation. It is the comparison between these two models that is of relevance to addressing the core research question posed by the present study.

In table 3, model 3 demonstrates that explicit religion is significantly associated with higher levels of self-esteem ($\beta = .14, p < .001$), and model 4 that implicit religion is also significantly associated with higher levels of self-esteem ($\beta = .05, p < .001$), although the effect is less strong. In table 4, model 3 demonstrates that explicit religion is significantly associated with higher levels of empathy ($\beta = .10, p < .001$), and model 4 that implicit religion is also significantly associated with higher levels of empathy ($\beta = .03, p < .001$), although again the effect is less strong.

Conclusion

Established within a developing series of studies shaped within the framework of the psychology of religion and intended to explore the correlates of individual differences of diverse forms of implicit religiosity, the aim of the present study was to draw on the data generated by the Young People's Attitudes to Religious Diversity Project (see Francis, Croft, Pyke, & Robbins, 2012) in order to address two primary research questions. The first research question draws on the Astley-Francis Scale of Attitude toward Theistic Faith (Astley, Francis, & Robbins, 2012) as a form of explicit religion in order to test whether the

established research findings linking explicit religion with higher levels of self-esteem and with higher levels of empathy hold true within this sample of 11,809 13- to 15-year-old students, while simultaneously taking into account the effects of personal factors (sex and age) and psychological factors (extraversion, neuroticism, and psychoticism). The second research question draws on a scale of scientific fundamentalism as a form of implicit religion in order to test whether scientific fundamentalism functions in the same way as explicit religion in relation to higher levels of self-esteem and higher levels of empathy.

In response to the first research question, the data confirmed significant positive effects of explicit religion (operationalised by attitude toward theistic faith) on both self-esteem ($\beta = .14, p < .001$) and empathy ($\beta = .10, p < .001$), after taking into account personal factors (age and sex) and psychological factors (extraversion, neuroticism, and psychoticism). In response to the second research question, the data also confirmed significant positive effects of implicit religion (operationalised by scientific fundamentalism) on both self-esteem ($\beta = .05, p < .001$) and empathy ($\beta = .03, p < .001$), again after taking into account personal factors and psychological factors. The effect size, however, was smaller for implicit religion than for explicit religion. Three main conclusions emerge from these findings.

The first conclusion concerns the psychological correlates of explicit religion among young people growing up in the UK today. Drawing on the Astley-Francis Scale of Attitude toward Theistic Faith as a form of explicit religion, the data suggest that young people who include a positive space for God within their worldview feel better about themselves (higher self-esteem) and feel better about other people (higher empathy). Alongside the findings from earlier studies in this series, connecting explicit religion with higher purpose in life (Francis, 2013a), with lower suicidal ideation (Francis, 2013b), with lower acceptance of alcohol and drugs (Penny & Francis, 2015) and with higher positive affect and lower negative affect (Francis & Penny, 2016), these new data support the view that there are recognisable

psychological correlates of explicit religion identifiable among young people in contemporary society.

The second conclusion concerns the empirically verifiable strength of Bailey's notion of implicit religion for interrogating and understanding identifiable phenomena in contemporary society. The assumption underpinning the research tradition displayed in the present study is that, if phenomena observed in contemporary society properly justify the description as implicit religion, then (in some ways at least) such phenomena should be shown empirically to function like explicit religion in shaping individual lives or social identities. These new data, taken alongside data generated by earlier studies conducted within this research tradition, add weight to the coherence and validity of Bailey's concept of implicit religion. This affirmation, however, needs to be qualified by two recognitions. In the present study the effect size of implicit religion on the dependent variable is smaller than the effect size of explicit religion. Earlier studies like Francis (2013a) and Francis (2013b), have shown that some indices of implicit religion may be more effective at generating the positive correlates of explicit religion (like enhancing purpose in life) than at generating the protective correlates of explicit religion (like mitigating suicidal ideation).

The third conclusion concerns the specific thesis advanced by the present study that belief in science (understood in this extreme way) functions as an implicit religion, fulfilling functions similar to those fulfilled by explicit religion. These new data indicate that scientific fundamentalism is associated both with higher self-esteem and with higher empathy (characteristics associated with explicit religion). Given the absence of any existing *prima facie* theory for linking scientific fundamentalism with higher self-esteem and higher empathy, Bailey's notion of implicit religion offers an insightful suggestion. The psychological mechanisms linking scientific fundamentalism with these personally and socially beneficial outcomes can be further illuminated by a close examination of Bailey's

three defining characteristics of implicit religion (as summarised by Francis, Flere, Klanjšek, Williams, & Robbins, 2013, p. 953) and by an exploration of how these three characteristics may operate in individual lives. According to Bailey, implicit religion displays *commitment*.

In this sense, those who believe in science in this way are committed to that belief.

Commitment generates a sense of identity (enhancing self-esteem) and reduces threats from others (enhancing openness to others and empathy). According to Bailey, implicit religion provides *integrating foci*. In this sense, those who believe in science in this way hold to an integrating narrative that makes sense of the world, establishes the individual's place in the world, and explains the existential questions of life. An integrating narrative enhances the sense of competency and capacity (enhancing self-esteem) and offers a secure basis of knowing alongside which others can be placed (enhancing security alongside others and empathy). According to Bailey, implicit religion displays *intensive concerns with extensive effects*. In this sense, those who believe in science in this way hold an intensive belief with an extensive reach. Belief in science, in the sense of believing that science alone can give us true knowledge and therefore solve the problems of the universe, indeed carries with it extensive effects. Such a wide-ranging confidence in science, like confidence in theistic faith, brings a sense of meaning and purpose in life (enhancing self-esteem) and a sense of a brighter future for all people (reducing threat and enhancing empathy).

The present study has re-focused attention on the conceptualisation and measurement of an exaggerated belief in science, a field in which there has been little recent investment. There are four clear (and inter-related) limitations with the present study that need to be properly addressed by future studies that build on these foundations. The first limitation concerns the restricted age range of the sample. Richer analyses could emerge from future research covering a wider age range of participants. The second limitation concerns embedding this research question within a project designed to map a wider range of factors

relating to individual differences in young people's attitudes toward religion and toward religious diversity. Richer analyses could emerge from future research more fully focused on the operationalisation of factors specifically addressing belief in God and belief in science. The third limitation concerns the use of the short measure of scientific fundamentalism, which inevitably fails to capture and operationalise the resonances of the wider construct. Future research may now wish to concentrate on developing a richer and more nuanced measure of scientific fundamentalism. The fourth limitation concerns the small effect size on which the statistically significant findings have been built linking scientific fundamentalism with both self-esteem and empathy. The development of a richer measure of scientific fundamentalism in future research would offer the opportunity to test whether a better measure may result in establishing stronger associations.

Note

Young People's Attitudes to Religious Diversity Project (AHRC Reference: AH/G014035/1) was a large-scale mixed methods research project investigating the attitudes of 13- to 16-year-old students across the United Kingdom. Students from a variety of socio-economic, cultural, ethnic and religious backgrounds from different parts of England, Wales, Northern Ireland and Scotland, with the addition of London as a special case, took part in the study. Professor Robert Jackson was principal investigator and Professor Leslie J. Francis was co-investigator. Together they led a team of qualitative and quantitative researchers based in the Warwick Religions and Education Research Unit, within the Centre for Education Studies at the University of Warwick. The project was part of the AHRC/ESRC Religion and Society Programme and ran from 2009-2012.

References

- Aghababaei, N. (2016). Scientific faith and positive psychological functioning. *Mental Health, Religion and Culture*, 7, 734-741. doi.org/10.1080/13674676.2016.1256383
- Alexander, D. (2001). *Rebuilding the matrix: Science and faith in the twenty-first century*, Oxford: Lion.
- Allport, G. W., & Ross, J. M. (1967). Personal religious orientation and prejudice. *Journal of Personality and Social Psychology*, 5, 432-443. doi.org/10.1037/h0021212
- ap Siôn, T., & Edwards, O. (2013). Say one for me: The implicit religion of prayers from the street. *Mental Health, Religion and Culture*, 9, 922-935.
doi.org/10.1080/13674676.2012.758398
- ap Siôn, T., & Nash, P. (2013). Coping through prayer: An empirical study in implicit religion concerning prayers for children in hospital. *Mental Health, Religion and Culture*, 9, 936-952. doi.org/10.1080/13674676.2012.756186
- Argyle, M. (1958). *Religious behaviour*. London: Routledge and Kegan Paul.
doi.org/10.4324/9780203001271
- Aruguete, M., Griffith, J., Edman, J., Green, T., & McCutcheon, L. (2014). Body image and celebrity worship. *Implicit Religion*, 17, 223-234. doi.org/10.1558/imre.v17i2.223
- Astley, J. (2018). The naming of parts: Faith, formation, development and education. In R. Stuart-Buttle & J. Shortt (Eds.) *Christian faith, formation and education* (pp. 13-27). Cham, Switzerland: Palgrave Macmillan.
- Astley, J., & Francis, L. J. (2010). Promoting positive attitudes toward science and religion among sixth-form pupils: Dealing with scientism and creationism. *British Journal of Religious Education*.32, 189-200. doi.org/10.1080/01416200.2010.498604

- Astley, J., Francis, L. J., & Robbins, M. (2012). Assessing attitude towards religion: The Astley-Francis Scale of Attitude toward Theistic Belief. *British Journal of Religious Education, 34*, 183-193. doi.org/10.1080/01416200.2011.614735
- Bailey, E. I. (1997). *Implicit religion in contemporary society*. G A Kampen, The Netherlands: Kok Pharos.
- Bailey, E. I. (1998). *Implicit religion: An introduction*. London: Middlesex University Press.
- Bailey, E. I. (Ed.). (2002). *The secular quest for meaning in life: Denton papers in implicit religion*. New York: Edwin Mellen Press Ltd.
- Barr, J. (1981). *Fundamentalism*. London: SCM Press.
- Barr, J. (1984). *Escaping from fundamentalism*. London: SCM Press.
- Blaine, B.E., Trivedi, P., & Eshleman, A. (1998). Religious belief and the self-concept: Evaluating the implications for psychological adjustment. *Personality and Social Psychology Bulletin, 24*, 1040-1052. doi.org/10.1177/01461672982410002
- Blazek, M., & Besta, T. (2012). Self-concept clarity and religious orientations: Prediction of purpose in life and self-esteem. *Journal of Religion and Health, 51*, 947-960. doi.org/10.1007/s10943-010-9407-y
- Burnett, T., What is scientism? Retrieved 16 June 2017 from <https://www.aaas.org/page/what-scientism>
- Chan, R., & Joseph, S. (2000). Dimensions of personality, domains of aspiration, and subjective wellbeing. *Personality and Individual Differences, 28*, 347-354. doi.org/10.1016/S0191-8869(99)00103-8
- Cheng, H., & Furnham, A. (2003). Personality, self-esteem, and demographic predictions of happiness and depression. *Personality and Individual Differences, 34*, 921-942. doi.org/10.1016/S0191-8869(02)00078-8

- Collins, R. F. (1983). Fundamentalism. In A. Richardson & J. Bowden (Eds.) *A new dictionary of Christian theology* (pp. 222-224). London: SCM Press.
- Corulla, W. J. (1990). A revised version of the psychoticism scale for children. *Personality and Individual Differences, 11*, 65-76. doi.org/10.1016/0191-8869(90)90169-R
- Coyne, J. A. (2009). *Why evolution is true*. Oxford: Oxford University Press
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*, 297-334. doi.org/10.1007/BF02310555
- Davis III, R. F., & Kiang, L. (2016). Religious identity, religious participation, and psychological wellbeing in Asian American adolescents. *Journal of Youth Adolescence, 45*, 532-546. doi.org/10.1007/s10964-015-0350-9
- Dawkins, R. Is science a religion? Retrieved 8 June, 2017 from <http://www.skeptical-science.com/essays/science-religion-richard-dawkins/>
- DeVellis, R. F. (2003). *Scale development: Theory and applications*. London: Sage.
- Draper, P. (2005). God, science, and naturalism. In W. J. Wainwright (Ed.). *The Oxford handbook of philosophy of religion* (pp. 272-303). New York: Oxford University Press.
- Dupré, J. (2001). *Human nature and the limits of science*. Oxford: Clarendon.
- Duriez, B. (2004a). Are religious people nicer people? Taking a closer look at the religion-empathy relationship. *Mental Health, Religion and Culture, 7*, 249-254. doi.org/10.1080/13674670310001606450
- Duriez, B. (2004b). A research note on the relation between religiosity and racism: The importance of the way in which religious contents are being processed. *International Journal for the Psychology of Religion, 14*, 177-191. doi.org/10.1207/s15327582ijpr1403_3

- Eagleton, T. (2009). *Reason, faith, and revolution: Reflections on the God debate*. New Haven, CT: Yale University Press.
- Eysenck, H. J., & Eysenck, S. B. G. (1975). *Manual of the Eysenck Personality Questionnaire (adult and junior)*. London: Hodder and Stoughton.
- Eysenck, S. B. G., Easting, G., & Pearson, P. R. (1984). Age norms for impulsiveness in children. *Personality and Individual Differences*, 5, 315-321. doi.org/10.1016/0191-8869(84)90070-9
- Eysenck, S. B. G. (1981). Impulsiveness and antisocial behaviour in children. *Current Psychological Research*, 1, 31-37. doi.org/10.1007/BF02684423
- Eysenck, S. B. G., & Eysenck, H. J. (1980). Impulsiveness and venturesomeness in children. *Personality and Individual Differences*, 1, 73-78. doi.org/10.1016/0191-8869(80)90006-9
- Eysenck, S. B. G., & McGurk, B. J. (1980). Impulsiveness and venturesomeness in a detention centre population. *Psychological Reports*, 47, 1299-1306. doi.org/10.2466/pr0.1980.47.3f.1299
- Eysenck, S. B. G., Eysenck, H. J., & Barrett, P. (1985). A revised version of the psychoticism scale. *Personality and Individual Differences*, 6, 21-29. doi.org/10.1016/0191-8869(85)90026-1
- Farias, M., Newheiser, A.-K., Kahane, G., & de Toledo, Z. (2013). Scientific faith: Belief in science increases in the face of stress and existential anxiety. *Journal of Experimental Social Psychology*, 49, 1210-1213. doi.org/10.1016/j.jesp.2013.05.008
- Fawcett, B., Francis, L. J., Linkletter, J., & Robbins, M. (2012). Religiosity and alcohol avoidance: A study among Canadian Baptist youth. *The Journal of Youth Ministry*, 11, 45-62.
- Feyerabend, P. (1987). *Farewell to reason*. London: Verso.

- Francis, L. J. (1992). Is psychoticism really a dimension of personality fundamental to religiosity? *Personality and Individual Differences*, *13*, 645-652.
doi.org/10.1016/0191-8869(92)90235-H
- Francis, L. J. (1996). The development of an abbreviated form of the Revised Junior Eysenck Personality Questionnaire (JEPQR-A) among 13- to 15-year-olds. *Personality and Individual Differences*, *21*, 835-844. doi:10.1016/S0191-8869(96)00159-6
- Francis, L. J. (1997). The psychology of gender differences in religion: A review of empirical research. *Religion*, *27*, 81-96. doi.org/10.1006/reli.1996.0066
- Francis, L. J. (2007). God images and empathy: A study among secondary school pupils in England. In P. Heggy (Ed.) *What do we imagine God to be? The function of 'God images' in our lives* (pp. 67-88). Lampeter: Edwin Mellen Press.
- Francis, L. J. (2013a). Implicit religion, explicit religion and purpose in life: An empirical enquiry among 13- to 15-year-old adolescents. *Mental Health, Religion and Culture*, *16*, 909-921. doi.org/10.1080/13674676.2012.756615
- Francis, L. J. (2013b). The association between suicidal ideation, explicit religion and implicit religion: An empirical enquiry among 13- to 15-year-old adolescents. *Implicit Religion*, *16*, 93-109. doi.org/10.1558/imre.v16i1.93
- Francis, L. J., Astley, J., & McKenna, U. (2018). Science disproves the biblical account of creation: Exploring the predictors of perceived conflict between science and religion among 13- to 15-year-old students. *British Journal of Religious Education*, online first.
- Francis, L. J., Brown, L. B., & Philipchalk, R. (1992). The development of an abbreviated form of the Revised Eysenck Personality Questionnaire (EPQR-A): Its use among students in England, Canada, the USA and Australia. *Personality and Individual Differences*, *13*, 443-449. doi.org/10.1016/0191-8869(92)90073-X

- Francis, L. J., Croft, J., & Pyke, A. (2012). Religious diversity, empathy and God images: Perspectives from the psychology of religion and empirical theology shaping a study among adolescents in the UK. *Journal of Beliefs and Values, 33*, 293-307.
doi.org/10.1080/13617672.2012.732810
- Francis, L. J., Croft, J., Pyke, A., & Robbins, M. (2012). Young people's attitudes to religious diversity: Quantitative approaches from social psychology and empirical theology. *Journal of Beliefs and Values, 33*, 279-292.
doi.org/10.1080/13617672.2012.732808
- Francis, L. J., Flere, S., Klanjšek, R., Williams, E., & Robbins, M. (2013). Attitude toward Christianity and New Age beliefs among undergraduate students in Slovenia: A study in implicit religion. *Mental Health, Religion and Culture, 9*, 953-963.
doi.org/10.1080/13674676.2012.759721
- Francis, L. J., Gibson, H. M., & Fulljames, P. (1990). Attitude towards Christianity, creationism, scientism and interest in science among 11-15 year olds. *British Journal of Religious Education, 13*, 4-17. doi.org/10.1080/0141620900130102
- Francis, L. J., & Greer, J. E. (2001). Shaping adolescents' attitudes toward science and religion in Northern Ireland: The role of scientism, creationism and denominational schools. *Research in Science and Technological Education, 19*, 39-53.
doi.org/10.1080/02635140120046213
- Francis, L. J., & Hermans, C. A. M. (2009). Psychological health and attitude toward Christianity: a study among pupils attending Catholic schools in the Netherlands. *Journal of Religious Education, 57*(2), 47-58.
- Francis, L. J., & Kaldor, P. (2002). The relationship between religion and Rosenberg's measure of self-esteem in an Australian population sample. *Transpersonal Psychology Review, 6*, 53-59.

- Francis, L. J., Lewis, J. M., Philipchalk, R., Brown, L. B., & Lester, D. (1995). The internal consistency reliability and construct validity of the Francis Scale of Attitude toward Christianity (adult) among undergraduate students in the UK, USA, Australia and Canada. *Personality and Individual Differences, 19*, 949-953. doi.org/10.1016/S0191-8869(95)00131-X
- Francis, L. J., Lewis, J. M., Philipchalk, R., Lester, D., & Brown, L. B. (1995). Reliability and validity of a short scale of attitude toward Christianity among students in the UK, USA, Australia and Canada. *Psychological Reports, 77*, 431-434. doi.org/10.2466/pr0.1995.77.2.431
- Francis, L. J., & Pearson, P. R. (1987). Empathic development during adolescence: Religiosity the missing link? *Personality and Individual Differences, 8*, 145-148. doi.org/10.1016/0191-8869(87)90024-9
- Francis, L. J., & Penny, G. (2014). Gender differences in religion. In V. Saroglou (Ed.). *Religion, personality and social behaviour* (pp. 313-337). New York. Psychology Press.
- Francis, L. J., & Penny, G. (2016). Implicit religion and psychological wellbeing: A study among adolescents without formal religious affiliation or practice. *Implicit Religion, 19*, 61-78. doi.org/10.1558/imre.v19i1.30009
- Francis, L. J., & Robbins, M. (2009). Prayer, purpose in life, and attitude toward substances: A study among 13- to 15-year-olds in England and Wales. *Counselling and Spirituality, 28*, 83-104.
- Francis, L. J., Robbins, M., & Gibson, H. M. (2006). A revised semantic differential scale distinguishing between negative and positive God images. *Journal of Beliefs and Values, 27*, 237-240. doi.org/10.1080/13617670600850083

- Francis, L. J., Robbins, M., & Williams, E. (2006). Believing and implicit religion beyond the churches: Religion, superstition, luck and fear among 13- to 15-year-old girls in Wales. *Implicit Religion, 9*, 74-89. doi.org/10.1558/imre.2006.9.1.74
- Francis, L. J., Williams, E., & Robbins, M. (2006). The unconventional beliefs of conventional churchgoers: The matter of luck. *Implicit Religion, 9*, 305-314. doi.org/10.1558/imre.v9i3.305
- Francis, L. J., Williams, E., & Robbins, M. (2008). Church attendance, implicit religion and belief in luck: The relationship between conventional religiosity and alternative spirituality among adolescents. *Implicit Religion, 11*, 239-254.
- French, H. W. (2002). Religion and football: The cult of the fighting game-cock. In E. I. Bailey (Ed.), *The secular quest for meaning in life* (pp. 319-336). New York: Edwin Mellon Press Ltd.
- Fulljames, P., & Francis, L. J. (1988). The influence of creationism and scientism on attitudes towards Christianity among Kenyan secondary school students. *Educational Studies, 14*, 77-96. doi.org/10.1080/0305569880140108
- Fulljames, P., Gibson, H. M., & Francis, L. J. (1991). Creationism, scientism, Christianity and science: a study in adolescent attitudes. *British Educational Research Journal, 17*, 171-190. doi.org/10.1080/0141192910170208
- Furnham, A., & Cheng, H. (2000). Perceived parental behaviour, self-esteem and happiness. *Social Psychology and Psychiatric Epidemiology, 35*, 463-470. doi.org/10.1007/s001270050265
- Furrow, L. J., King, P. E., & White, K. (2004). Religion and positive youth development: Identity, meaning, and prosocial concerns. *Applied Developmental Sciences, 8*, 17-26. doi.org/10.1207/S1532480XADS0801_3
- Giere, R. N. (2006). *Scientific perspectivism*. Chicago, IL: University of Chicago Press.

- Glaz, S. (2015). The importance of terminal values and religious experience of God's presence and God's absence in the lives of university students with various levels of empathy. *Journal of Religion and Health*, 54, 1052-1067. doi.org/10.1007/s10943-014-9884-5
- Gorsuch, R. L., & Venable, G. D. (1983). Development of an 'age universal' I-E scale. *Journal for the Scientific Study of Religion*, 22, 181-187. doi.org/10.2307/1385677
- Gray, J. (2004). *Heresies*. London: Granta.
- Gudjonsson, G. H., Einarsson, E., Bragason, Ó. Ö., & Sigurdsson, J. E., (2006). Personality predictors of self-reported offending in Islamic students. *Psychology, Crime and Law*, 12, 383-393. doi.org/10.1080/10683160500056929
- Hardy, S. A., Walker, L. J., Rackham, D. D., & Olsen, J. A. (2012). Religiosity and adolescent empathy and aggression: The mediating role of moral identity. *Psychology of Religion and Spirituality*, 4, 237-248. doi.org/10.1037/a0027566
- Haight, J. F. (2006). *Is nature enough? Meaning and truth in the age of science*. Cambridge: Cambridge University Press.
- Hughes, P. (2013). Spirituality and religious tolerance. *Implicit Religion*, 16, 65-91. doi.org/10.1558/imre.v16i1.65
- Hutchinson, I. (2011). *Monopolizing knowledge: A Scientist refutes religion-denying, reason-destroying scientism*. Belmont, MA: Fias Publishing.
- Jones, S. H., & Francis, L. J. (1996). Religiosity and self-esteem during childhood and adolescence. In L. J. Francis, W. K. Kay, & W. S. Campbell (Eds.), *Research in Religious Education* (pp. 189-205). Leominster: Gracewing.
- Kampourakis, K. (2014). *Understanding evolution*. Cambridge: Cambridge University Press.
- Kemp, D. (2001). Christaquarianism: A new socio-religious movement of post-modern society? *Implicit Religion*, 4, 27-140.

- Khan, Z. H., Watson, P. J., & Habib, F. (2005). Muslim attitudes toward religion, religious orientation and empathy among Pakistanis. *Mental Health, Religion & Culture*, 8, 49-61. doi.org/10.1080/13674670410001666606
- Kidd, I. (2014). Doing away with scientism. Retrieved June 16, 2017 from https://philosophynow.org/issues/102/Doing_Away_With_Scientism, *Philosophy Now*, Issue 102, May/June 2014.
- Kraus, R. (2009). The many faces of spirituality: A conceptual framework considering belly dance. *Implicit Religion*, 12, 51-72. doi.org/10.1558/imre.v12i1.051
- Krause, N. (2004). Assessing the relationships among prayer expectations, race, and self-esteem in late life. *Journal for the Scientific Study of Religion*, 43, 395-408. doi.org/10.1111/j.1468-5906.2004.00242.x
- Krause, N. (2009). Church-based social relationships and change in self-esteem over time. *Journal for the Scientific Study of Religion*, 48, 756-773. doi.org/10.1111/j.1468-5906.2009.01477.x
- Krause, N. (2012). Valuing the life experience of old adults and change in depressive symptoms: Exploring an overlooked benefit of involvement in religion. *Journal of Aging and Health*, 24, 227-249. doi.org/10.1177/0898264311412598
- Lessl, T. M. (1996). Naturalizing science: Two episodes in the evolution of a rhetoric of scientism'. *Western Journal of Communication*. 60(4), 379-396. doi:10.1080/10570319609374555
- Lewis, C. A. (2013). Mental health, implicit religion and culture. *Mental Health, Religion and Culture*, 16, 879-882. doi.org/10.1080/13674676.2013.847229
- Lewis, C. A., & Francis, L. J. (2014). Personality and religion among female university students in France. *Psychology, Society and Education*, 6(2), 68-81.
- Maitland, S. (1994). *A big enough God: Artful theology*. London: Mowbray.

Markstrom, C. A., Huey, E., Stilos, B. M., & Krause, A. L. (2010). Framework of caring and helping in adolescence: Are empathy, religiosity, and spirituality related constructs?

Youth and Society, 42, 59-80. doi.org/10.1177/0044118X09333644

Maxwell, J. A. (2003). Scientism. *International Encyclopedia of the Social Sciences*.

Retrieved June 16, 2017 from Encyclopedia.com:

<http://www.encyclopedia.com/social-sciences/applied-and-social-sciences-magazines/scientism>

Mehrabian, A., & Epstein, N. (1972). A measure of emotional empathy. *Journal of*

Personality, 40, 525-543. doi.org/10.1111/j.1467-6494.1972.tb00078.x

Midgley, M. (1985). *Evolution as a religion: Strange hopes and stranger fears*. London:

Methuen.

Miyamoto, R. H., Hishinuma, E. S., Nishimura, S. T., Nahulu, L. B., Andrade, N. N.,

Goebert, D. A., & Carlton, B. S. (2001). Path models linking correlates of self-esteem in a multi-ethnic adolescent sample. *Personality and Individual Differences*, 31, 701-

7012. doi.org/10.1016/S0191-8869(00)00172-0

Mochon, D., Norton, M. I., & Ariely, D. (2011). Who benefits from religion? *Social*

Indicators Research, 101, 1-15. doi.org/10.1007/s11205-010-9637-0

Mousavimoghadam, S. R., Nourmohammadil, M., Ranjbarian, N., & Rashidahal, M. (2014).

The relationship between religious orientation and students' self-esteem. *Health, Spiritual, Med Ethics*, 1(4), 14-21.

Nagel, T. (1986). *The view from nowhere*. New York: Oxford University Press.

Nelson, P. B. (1990). Religious orientation of the elderly: Relationship to depression and self-esteem. *Journal of Gerontological Nursing*, 16, 2, 29-35. doi.org/10.3928/0098-9134-

19900201-09

- Noordhof, P. (1995). Scientism. In T. Honderich (Ed.) *Oxford companion to philosophy* (p. 814). Oxford: Oxford University Press.
- O'Hear, A. (1989), *An introduction to the philosophy of science*. Oxford: Clarendon.
- Padgett, A. G. (2003). *Science and the study of God: A mutuality model for theology and science*. Grand Rapids, MI: Eerdmans.
- Paek, E. (2006). Religiosity and perceived emotional intelligence among Christians. *Personality and Individual Differences, 41*, 479-490.
doi.org/10.1016/j.paid.2006.01.016
- Palmisano, S., & Pannofino, N. (2013). It isn't just about money: The implicit religion of Amway Corporation. *Implicit Religion, 16*, 27-46. doi.org/10.1558/imre.v16i1.27
- Peacocke, A. (1993). *Theology for a scientific age: Being and becoming – natural, divine and human*. London: SCM Press.
- Penny, G., & Francis, L. J. (2014). Religion and self-esteem: A study among 13- to 15-year-old students in the UK. In J. H. Borders (Ed.) *Handbook on the psychology of self-esteem* (pp. 19-45). New York: Nova Science.
- Penny, G., & Francis, L. J. (2015). Implicit religion, explicit religion and attitude toward substances: An empirical enquiry among 13- to 15-year-old adolescents. *Implicit Religion, 18*, 373-397. doi.org/10.1558/imre.v18i3.28054
- Peters, T. (2006). Contributions for practical theology and ethics. In P. Clayton and Z. Simpson (Eds.). *The Oxford handbook of religion and science* (pp. 372-387). Oxford: Oxford University Press.
- Peterson, G. R. (2003). Demarcation and the scientific fallacy. *Zygon: Journal of Religion and Science, 38*(4), 751-761.
- Philosophy Basics. Scientism. Retrieved June 16, 2017 from
http://www.philosophybasics.com/branch_scientism.html

Pigliucci, M. (2002). *Denying evolution: Creationism, scientism, and the nature of science*.

Sunderland, MA: Sinauer Associates.

Preston, J. L. (2012). Religion is the opiate of the masses (but science is the methadone).

Religion, Brain and Behaviour, 1, 231-233. doi.org/10.1080/2153599X.2011.647855

Public Broadcasting Service. Retrieved June 16, 2017 from

<http://www.pbs.org/faithandreason/gengloss/sciism-body.html>

Rashidi, M., Mousavi, F. S., & Esmaeili, K. (2016). The relationship between styles of attachment to God and forgiveness and empathy among female students in the city of Qom. *Health, Spirituality and Medical Ethics*, 3(1), 18-24.

Regnerus, M. D., & Elder, G. H. (2003). Religion and vulnerability among low-risk adolescents. *Social Science Research*, 32, 633-658. doi.org/10.1016/S0049-089X(03)00027-9

Robbins, M., & Francis, L. J. (2009). The spiritual revolution and suicidal ideation: An empirical enquiry among 13- to 15-year-old adolescents in England and Wales. *International Journal of Children's Spirituality*, 14, 261-272. doi.org/10.1080/13644360903086539

Rogers, B. (2004). *Is nothing sacred?* New York, NY: Routledge.

Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton, NJ: Princeton University Press. doi.org/10.1515/9781400876136

Rosenkranz, P., & Charlton, B. G. (2013). Individual differences in existential orientation: Empathizing and systemizing explain the sex differences in religious orientation and science acceptance. *Archive for the Psychology of Religion*, 35, 119-146. doi.org/10.1163/15736121-12341255

- Ryan, R. M., Rigby, S., & King, K. (1993). Two types of religious internalization and their relations to religious orientations and mental health. *Journal of Personality and Social Psychology, 65*, 586-596. doi.org/10.1037/0022-3514.65.3.586
- Sagan, C., & Druryan, A. (2006). *The varieties of scientific experience: A personal view of the search for God*. New York, NY: Penguin.
- Schloss, J. P. (2006). Evolutionary theory and religious belief. In P. Clayton and Z. Simpson (Eds.) *The Oxford handbook of religion and science* (pp. 187-206). Oxford: Oxford University Press.
- Schludermann, E. H., Schludermann, S. M., & Huynh, C.-L. (2000). Religiosity, prosocial values, and adjustment among students in Catholic high schools in Canada. *Journal of Beliefs and Values, 21*, 99-115. doi.org/10.1080/13617670050002363
- Schnell, T., & Pali, S. (2013). Pilgrimage today: The meaning-making potential of ritual. *Mental Health, Religion and Culture, 16*, 887-902.
doi.org/10.1080/13674676.2013.766449
- Schnell, T., Francis, L. J., Lewis, C. A. (2011). Psychological perspectives on implicit religion. *Implicit Religion, 14*, 385-386. doi.org/10.1558/imre.v14i4.385
- Schuermans-Stekhoven (2014). Measuring spirituality as personal belief in supernatural forces: Is the Character Strength Inventory spirituality subscale a brief, reliable and valid measure? *Implicit Religion, 17*, 211-222. doi.org/10.1558/imre.v17i2.211
- Smith, E. I., & Crosby III, R. G. (2017). Unpacking religious affiliations: Exploring associations between Christian children's religious cultural context, God image, and self-esteem across development. *British Journal of Developmental Psychology, 35*, 76-90. doi.org/10.1111/bjdp.12156
- Sorell, T. (1994). *Scientism: Philosophy and the infatuation with science*. New York: Routledge.

- Stenmark, M. (2003). Scientism. In J. Wentzel van Huyssteen (Ed.). *Encyclopedia of science and religion* (2nd ed.). Retrieved June 16, 2017 from Encyclopedia.com:
<http://www.encyclopedia.com/education/encyclopedias-almanacs-transcripts-and-maps/scientism>.
- Stewart, F. (2017). *Punk rock is my religion: Straight edge Punk and 'religious' identity*. London: Routledge.
- Till, R. (2010). The personality cult of Prince: Purple Rain, sex and the sacred, and the implicit religion surrounding a popular icon. *Implicit Religion, 13*, 141-159.
doi.org/10.1558/imre.v13i2.141
- Valero-Aguayo, L., Ferro-Garcia, R., Lopez-Bermudez, M. A., & Selva-Lopez de Hualde, M. A. (2012). Reliability and validity of the Spanish adaptation of EOSS, comparing normal and clinical samples. *International Journal of Behavioural Consultation and Therapy, 7*, 151-158. doi.org/10.1037/h0100951
- van Huyssteen, J. Wentzel (1998). *Duet or Duel? Theology and science in a postmodern world*. London: SCM Press.
- Walker, D. (2013). You don't have to go to church to be a good Christian: The implicit religion of the cathedral carol service congregation. *Mental Health, Religion and Culture, 16*, 903-908. doi.org/10.1080/13674676.2012.758401
- Walker, D. S., Francis, L. J., & Robbins, M. (2010). You don't have to go to church to be a good Christian: The implicit religion of rural Anglican churchgoers celebrating harvest. *Implicit Religion, 13*, 319-325.
- Ward, K. (2008), *The big questions in science and religion*. West Conshohocken, PA: Templeton Press.
- Watson, P. J., Hood, R. W., & Morris, R. J. (1985). Dimensions of religiosity and empathy. *Journal of Psychology and Christianity, 4*(3), 73-85.

Watson, P. J., Hood, R.W., Morris, R. J., & Hall, J. R. (1984). Empathy, religious orientation and social desirability. *Journal of Psychology, 117*, 211-216.

doi.org/10.1080/00223980.1984.9923679

Whittington, B. L., & Scher, S. J. (2010). Prayer and subjective well-being: An examination of six different types of prayer. *International Journal for the Psychology of Religion, 20*, 59-68. doi.org/10.1080/10508610903146316

Williams, E., Francis, L. J., & Robbins, M. (2011). Implicit religion and the quest for meaning: Purpose in life and transcendental beliefs. *Implicit Religion, 14*, 45-65.

Table 1

Scale properties

Scale	N items	alpha	Mean	SD	Low	High
Theistic belief	7	.93	20.20	7.84	7	35
Scientific fundamentalism	3	.69	9.28	2.59	3	15
Self-esteem	10	.83	34.26	7.11	10	50
Empathy	23	.78	16.23	4.21	0	23
Extraversion	6	.68	4.69	1.53	0	6
Neuroticism	6	.68	3.10	1.80	0	6
Psychoticism	6	.58	1.15	1.30	0	6

Table 2

Correlation matrix

	Sex	Age	P	N	E	Em	Se	Th
Scientific fundamentalism (Sc)	-.08***	.02*	-.00	.02*	-.01	.04**	.07***	-.23***
Theistic faith (Th)	.09***	-.03***	-.17***	.03**	.01	.18***	.15***	
Self-esteem (Se)	-.15***	.02	-.16***	-.45***	.19***	-.03**		
Empathy (Em)	.40***	.03***	-.40***	.39***	.10			
Extraversion (E)	.09***	.04***	-.05***	-.13***				
Neuroticism (N)	.25***	.01	.01					
Psychoticism (P)	-.26***	.00						
Age	.01							

Note: * $p < .05$; ** $p < .01$; *** $p < .001$

Table 3

Regression model: Self-esteem

	r	Model 1	Model 2	Model 3 Explicit	Model 4 Implicit
<i>Personal factors</i>					
Sex	-.15***	-.15***	-.12***	-.13***	-.11***
Age	.02	.02	.02*	.02*	.01
<i>Psychological factors</i>					
Extraversion	.19***		.15***	.15***	.15***
Neuroticism	-.45***		-.40***	-.41***	-.41***
Psychoticism	-.16***		-.20***	-.18***	-.20***
<i>Religious factors</i>					
Explicit	.15***			.14***	
Implicit	.07***				.07***
Total R ²		.02	.26	.28	.27

Note: * $p < .05$; ** $p < .01$; *** $p < .001$

Table 4

Regression model: Empathy

	r	Model 1	Model 2	Model 3 Explicit	Model 4 Implicit
<i>Personal factors</i>					
Sex	.40***	.40***	.20***	.20***	.20***
Age	.03***	.03***	.02**	.02*	.02**
<i>Psychological factors</i>					
Extraversion	.10***		.13***	.13***	.14***
Neuroticism	.39***		.35***	.35***	.36***
Psychoticism	-.40***		-.37***	-.35***	-.36***
<i>Religious factors</i>					
Explicit	.18***			.10***	
Implicit	.04***				.05***
Total R ²		.10	.37	.38	.38

Note: * $p < .05$; ** $p < .01$; *** $p < .001$